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MONOGENETIC TREMATODES FROM THE SOUTHERN PACIFIC OCEAN. PART V. MONOPISTHOCOTYLEIDS FROM AUSTRALIAN FISHES, THE SUBFAMILY TROCHOPODINAE[1,2]

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In 1958 the Parasitology Section of the Virginia Institute of Marine Science undertook a study of the host specificity, zoogeography and systematics of the monogenetic trematodes and other parasites of Antarctic vertebrates. Subsequently two field expeditions were conducted, one at NAF McMurdo (1959) and the other at Wilkes Station (1961), Antarctica. As research progressed it was decided to include comparisons of parasites from Antarctic hosts with those from hosts taken from nearby ocean bottoms and shoal waters of adjacent land masses. To this end comparison collections were made of fishes from New Zealand, Australia, southern Chile, Drake Passage, Gulf of Guinea, and the Indian Ocean.

This paper on the Monogenea of certain Australian marine fishes is the first, of several planned, resulting from the Australian expedition which was undertaken as part of the United States Antarctic Research Program of the National Science Foundation. Subsequent publications in this series will include parasites from both sides of the Antarctic convergence.

This study is based on microscopic examination and systematic considerations of monogenetic trematodes collected from the gills of 1,909 host individuals representing 137 species. Parasites representing approximately 130 species and 17 fam-

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ilies were found on 83 of these host species. The remaining 54 were not parasitized by monogentic trematodes. Only six parasite species from five host species are discussed here. The others and a special discussion of ecological aspects will be the subjects of later works.

Examination of the literature reveals that in comparison to the total number of hosts and monogeneids reported from elsewhere in the world little is known about the monogeneid fauna of the Australian area. MacCallum (1917), Johnston and Tiegs (1922), Hughes (1928), Johnston (1929, 1930a, 1930b, 1931, 1934a, 1934b, 1937), Murray (1931), Woolcock (1936), Sandars (1944, 1945, 1947), Hargis and Dillon (1965), and Young (1967a, 1967b, 1967c, 1968) have described or reported monogenetic trematodes from fishes of Australian waters. Robinson (1961) noted that the majority of Monogenea known from the Southern Hemisphere were reported from Australia. Other works concerning Monogenea from the Southern Hemisphere are as follows: Brinkmann (1952) and Cordero (1944) from Chile; Manter and Prince (1953) and Laird (1958) from Fiji and the New Hebrides; and Blanchard (1847), Johnston (1931), Manter (1955), Manter and Walling (1958), Robinson (1961), Dillon and Hargis (1965a, 1965b), and Hargis and Dillon (1965) from New Zealand. Up to the present time a total of 79 species of monogenetic trematodes has been reported from Australian waters, 12 of these being reported by Johnston and Tiegs (1922) from freshwater fishes.

The research reported herein is a continuation of a long-range study of certain aspects of host specificity, zoogeography, and phylogeny of monogenetic trematodes being conducted by members of this Institute.

Materials and Methods: Host collections were made near Tweed Heads and Ulladulla, New South Wales; Lakes Entrance, Victoria; Gladstone, Queensland; Dunalley and Hobart, Tasmania; and Port Kenney, South Australia. The fish were procured from commercial fishery operations in which Danish seines, hand lines, and gill nets were used. Messrs. William Stanley Wilson and William Saunders, the field collectors, accompanied the vessels and took the host specimens as they came on board. Collections were made from March through July of 1962.

Mr. Wilson identified the fish with the aid of experienced fishing

vessel captains and using the keys and descriptions of Waite (1923), Graham (1956), Parrott (1957, 1958, 1959), and Roughley (1953). Since the vessel captains could help with or verify identifications, and since all species captured are relatively common, it is believed that host identifications are reliable. Scientific names of hosts are those given by Munro (1958), Roughley (1953), and Parrott (1959).

In the locality descriptions given below, the nearest town or prominent geographical feature and its province are given first, followed by the approximate site of capture of the host. The place of capture is followed by the depth and bottom type in parentheses. Distance is in statute miles.

The monogenetic trematodes were collected using a procedure outlined by Hargis (1953). This technique works best when the gill arches are separated from each other before immersion in the relaxant. However, according to Mr. Wilson, such separation was generally not possible because of trying shipboard conditions. As a result, relaxation of worms on internal gill surfaces not readily bathed by the Chloretone-seawater solution was somewhat variable. Such unevenness of relaxation probably also resulted from the varying physiological conditions of the worms themselves at the time of killing, since all hosts could not be processed at the same time. The trematodes were killed, fixed, and preserved by adding AFA (aceto-formalin-alcohol). This technique has proven advantageous when collecting large numbers of hosts as it facilitates rapid handling.

The parasites were removed from the gill material and sediment with the aid of a stereomicroscope and stored in vials containing a solution of 5% glycerol in 70% ethanol.

For preparation of whole mounts the worms were removed from the preservative, hydrated, overstained, destained, dehydrated, cleared, and mounted. The parasites were stained with one of the following: (1) Reynolds' double stain (Delafield's hematoxylin plus alum cochineal); (2) alum cochineal; (3) Harris' hematoxylin; and (4) Harris' hematoxylin with either sodium bicarbonate for "bluing" or eosin as a counterstain. As many stains as possible were used on each species to study the various internal and external structures. The following gave good results: (1) Reynolds' double stain for internal structures and glands, (2) alum cochineal as a general stain, (3) Harris' hematoxylin, alone or with sodium bicarbonate for reproductive structures, (4) the latter stain, with eosin as a counterstain, for reproductive organs and to reveal posthaptoral septation. If worms were few, only alum cochineal and/or Reynolds' double stain were used.

The worms were overstained and immediately destained using a solution of two to four drops of concentrated HCl in 100 ml of 30% ethanol. This procedure afforded better control of the amount of stain retained by the specimen than progressive staining. After dehydration, the worms were cleared in deacidified beechwood creosote and mounted permanently in Piccolyte.

Only those specimens which were well-relaxed and possessed clear morphological characters were used for identification and study. Diagnoses and descriptions were based on adult individuals, sexual maturity being the criterion for adulthood. Sexual maturity was determined by either (1) the presence of an egg *in utero,* (2) attainment of the same approximate size and morphological condition as individuals with eggs, or (3) by the apparently mature condition of the gonads (especially the ovary) where no egg was observed.

All measurements were made with the use of a filar micrometer and are given in microns unless otherwise noted. In indicating these measurements the mean is given, followed by the range (minimum and maximum) in parentheses. In cases where more than five specimens were measured, the standard deviation (S), standard error ($S_{\bar{x}}$), and the interval estimate at the 95% level ($t_{.05}S_{\bar{x}}$) follow the range. For convenience the alphabetical symbols SE and CL are established for standard error ($S_{\bar{x}}$) and confidence limits or interval estimate at the 95% level ($t_{.05}S_{\bar{x}}$), respectively. The number of measurements used in the calculations appears in parentheses before these data. Measurements of curved structures were across the lines subtending the greatest arcs described by these structures. All egg measurements were taken of the main portion of the egg capsule, exclusive of the filament. The value of filament length as a taxonomic character is doubtful since great variation occurs within a species. Measurements of soft parts, which are subject to contraction and expansion in life and shrinkage in death, can be considered of value for comparison only when specimens have been similarly treated or where differences between individuals or groups of individuals being compared are great. Measurements of hard parts are thought to be free of such vagaries and are considered more reliable as taxonomic characters. Camera lucida and microprojector drawings were used to facilitate identification and in the preparation of figures.

The taxonomic scheme employed is essentially that of Sproston (1946) and Yamaguti (1963). The work of Bychowsky (1957) has also been considered and his conclusions discussed where possible.

The morphological terminology used in the descriptions is that of Hargis (1958), who compiled a list of useful terms from his own studies and from the literature.

ORDER MONOGENEA CARUS, 1863

Suborder Monopisthocotylea Odhner, 1912

SUPERFAMILY CAPSALOIDEA PRICE, 1936

Family Capsalidae Baird, 1853

Subfamily Trochopodinae (Price, 1936) Sproston, 1946, emend.

Synonyms: Trochopinae Price, 1936; Megalocotylinae Bychowsky, 1957.

Diagnosis: Capsalidae. Diagnosis that of Yamaguti (1963) except as

follows: (1) pharynx with or without constrictions; and (2) common genital opening marginal or proximal to margin behind left prohaptor.

Type Genus: Trochopus Diesing, 1850.

Discussion: The above emendation is made to accommodate *Allosprostonia tauvinae* new genus, new species. In addition, the figure of *Sprostonia squatinae* (MacCallum, 1921) Bychowsky, 1957 as illustrated by MacCallum (1921) shows definite constrictions of the pharynx, which Yamaguti (1963) overlooked in his diagnosis of the subfamily Trochopodinae.

Price (1936) proposed a new subfamily in the Capsalidae, the group Trochopinae which included the genera *Trochopus* Diesing, 1850, and *Macrophyllida* Johnston, 1929. He suppressed *Megalocotyle* Folda, 1928 as a synonym of *Trochopus* Diesing, 1850. Upon re-examination of the large number of species of *Trochopus*, Price (1939) decided that they fall into two groups and therefore reinstated the genus *Megalocotyle* Folda, 1928.

Dr. Baylis, in personal communication with Sproston (Sproston, 1946), pointed out that the correct spelling of the subfamily name was Trochopodinae. Sproston (1946) then emended the subfamily and corrected the name according to Dr. Baylis' suggestion.

Bychowsky (1957) split the subfamily Trochopodinae (Price, 1936) Sproston, 1946 into two subfamilies: (1) Megalocotylinae Bychowsky, 1957, with *Megalocotyle* Folda, 1928 as the type genus, and (2) Trochopodinae (Price, 1936) Sproston, 1946, with *Trochopus* Diesing, 1850 as the type genus. He did this on the basis of whether there were an unequal or equal number, in the former and latter respectively, of peripheral depressions separated by septa on the posthaptor.

Yamaguti (1963) considered Megalocotylinae Bychowsky, 1957 as a synonym of Trochopodinae (Price, 1936) Sproston, 1946, combining the two. He also proposed two new genera, *Allomegalocotyla* and *Pseudomegalocotyla.*

After careful study of the generic characters (Table 1) which may be considered taxonomically significant (type of prohaptor, number of septa, position of prostate reservoir, testicular arrangement, position of vaginal opening) within the subfamily Trochopodinae (Price, 1936) Sproston, 1946, the authors accept, with the emendations previously made and to follow, the rearrangement as proposed by Yamaguti (1963).

The genus *Trochopella,* as proposed by Euzet and Trilles (1962), is considered to be a synonym of *Trochopus* Diesing, 1850. As can be ascertained from Table 1, all the major taxonomic characters of the genus *Trochopella* are the same as those of *Trochopus.* Although Euzet and Trilles (1962) did not mention the position of the prostate reservoir in the text, their drawing indicates its presence inside of the cirrus pouch.

Genus *Trochopus* Diesing, 1850

Synonym: Placunella Beneden and Hesse, 1863.

Diagnosis: Trochopodinae. Diagnosis that of Yamaguti (1963).

TABLE 1. Comparison of the major taxonomic characters separating the genera of the subfamily Trochopodinae.

	Trochopus (Type Genus)	*Megalocotyle*	*Pseudomegalocotyla*	*Allomegalocotyla*	*Macrophyllida*	*Sprostonia*	*Allosprostonia* n. gen.	*Mediavagina* n. gen.	*Pseudobenedenia*	*Trochopella**
Type of prohaptor	Paired suckers	Paired suckers	Paired suckers	Paired suckers	Fan-like glandular areas	Paired suckers united by common hood	Paired suckers united by common hood	Paired suckers	Paired suckers	Paired suckers
Number of septa	8–12	6–7	9; 4 lateral bifurcated	7	5	7; postero-lateral trifid or bifid, 4 or 6 incomplete septa	5	5	7	12
Position of prostate reservoir in respect to cirrus pouch	Inside	Inside	Inside	Outside	Inside	Outside	Outside	Inside	Inside	Inside (?)
Testicular arrangement	Juxtaposed	Juxtaposed	Juxtaposed	Juxtaposed	Obliquely tandem	Juxtaposed	Juxtaposed	Tandem	Juxtaposed	Juxtaposed
Position of vaginal opening	Left, posterior to genital pore	Left margin close to, or together with, genital pore	Midventral, immediately behind pharynx	Left of ootype far posterior to genital pore	Left margin just posterior to genital pore	Left margin just posterior to genital pore	Close to left margin posterior to genital pore	Midventral in region of vitelline reservoir	Midventral in region of vitelline reservoir	Left margin just posterior to genital pore
Reference	Yamaguti (1963)	Yamaguti (1963)	Yamaguti (1963)	Yamaguti (1963)	Yamaguti (1963) plus present study	Yamaguti (1963) plus present study	Present study	Present study	Dollfus & Euzet (1964)	Euzet & Trilles (1962)

* See discussion on this genus.

Type Species: Trochopus tubiporus (Diesing, 1836) Beneden and Hesse, 1863.

Trochopus hobo Yamaguti, 1942
Figs. 1–10

Host: Chelidonichthys kumu (Lesson and Garnot), Red Gurnard or Kumukumu or Latchet; family Triglidae.

Locality: Lakes Entrance, Victoria; 45 statute miles ESE of Lakes Entrance (65–75 fathoms).

Previously Reported Host and Locality: Chelidonichthys kumu (Lesson and Garnot); Hamazima, Japan.

Gear Used: Danish seine.

Location: Gills.

Number Studied: 19.

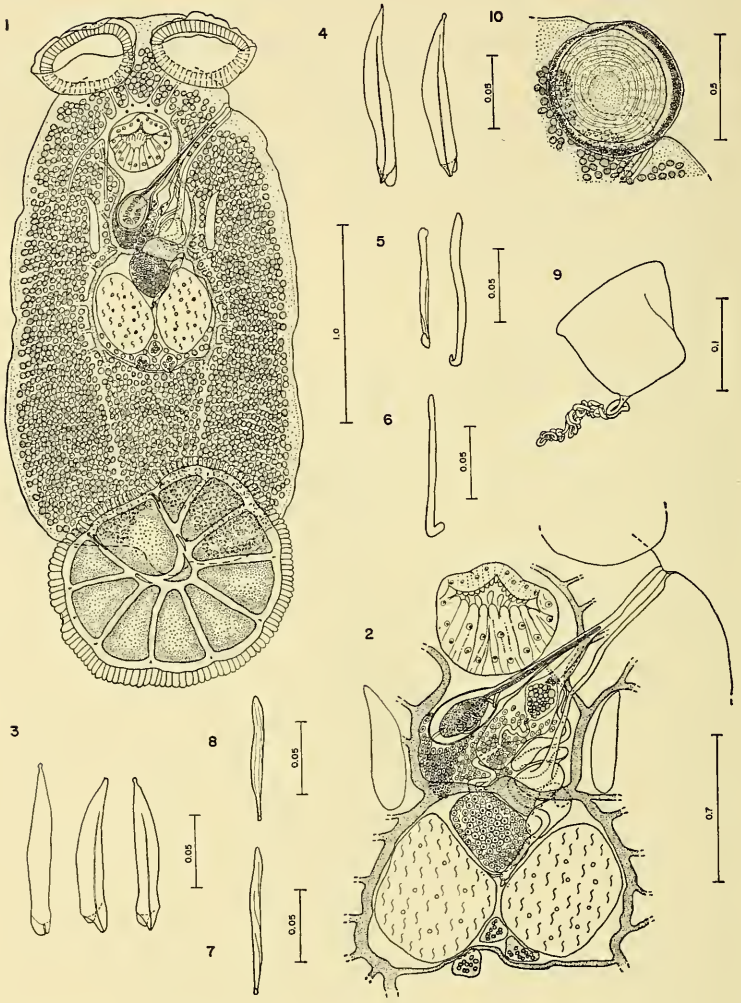
Number Measured: 12.

Homoeotypes: USNM Helm. Coll. No. 71199 (four specimens).

Redescription: Body elliptical, flattened dorsoventrally, (6) 3,640 (2,860–4,670), S = 707, SE = 289, CL = 742 long by (8) 2,100 (1,490–3,000), S = 553, SE = 195, CL = 462 wide. Cuticle fairly thin and smooth. Prohaptor a pair of ventrolateral suckers; left sucker (8) 503 (405–602), S = 68.6, SE = 24.3, CL = 57.4 long by (11) 501 (416–636), S = 71.5, SE = 21.6, CL = 48.0 wide; right sucker (9) 503 (399–600), S = 74.1, SE = 24.7, CL = 57.0 long by (12) 501 (423–638), S = 70.3, SE = 20.3, CL = 44.7 wide. Posthaptor a subsessile, concavo-convex sucker, opening ventrally, (10) 1,430 (1,120–1,950), S = 298, SE = 94.2, CL = 213 long by (10) 1,530 (1,220–2,070), S = 285, SE = 90.1, CL = 204 wide, divided by septa into one small, crescent-shaped central and ten peripheral depressions (loculi); margin of post-haptor a strong muscular rim, surrounded by scalloped marginal membrane (11) 135 (110–173), S = 19.4, SE = 5.84; CL = 13.0 wide; armed with 3 pairs of dissimilar anchors and 14 marginal hooks. First anchors large, robust, left (6) 103 (85.5–116), S = 11.4, SE = 4.65, CL = 12.0 long and right (5) 104 (91.4–117), S = 10.5, SE = 4.72, CL = 13.1 long, with slightly knobbed and tapered external tips and bifid (a slightly pointed ventral and a blunt dorsal) internal tips; second pair of anchors elongate, left (4) 96.2 (81.0–111) long and right (7) (96.8) (78.7–116), S = 10.8, SE = 4.07, CL = 9.97 long, more robust than third pair with slightly recurved blunt tips; third pair of anchors elongate, left (1) 110 long and right (2) 97.6 (84.0–111) long, with recurved pointed tips. Posthaptoral hooks (5) 9.91 (7.96–12.4), S = 2.32, SE = 1.04, CL = 2.88 long.

Pharynx muscular, (10) 385 (273–543), S = 88.9, SE = 28.1, CL = 63.6 long by (10) 420 (303–662), S = 108, SE = 34.1, CL = 77.2 wide, papillated internally. Mouth subterminal, anteroventral to pharynx. Esophagus short; gut bifurcated, crura with medial and lateral dendritic branching, not confluent posteriorly.

Two testes, juxtaposed, entire, fenestrated, oval in outline, left (8) 534



FIGURES 1–10. *Trochopus hobo* Yamaguti, 1942. (Scale is in mm.) 1, Whole mount, ventral view (posthaptor twisted bringing posterior loculus about 135° out of alignment in the clockwise direction). 2, Reproductive organs and terminal genitalia, ventral view. 3, Left first anchor. 4, Right first anchor. 5, Left second anchor. 6, Right second anchor. 7, Left third anchor. 8, Right third anchor. 9, Egg *in utero*, ventral view. 10, Left prohaptoral sucker, ventral view.

(383–696), S = 117, SE = 41.2, CL = 97.5 long by (8) 391 (286–592), S = 110, SE = 38.9, CL = 92.0 wide and right (8) 529 (385–696), S = 118, SE = 41.7, CL = 98.7 long by (8) 379 (267–572), S = 119, SE = 42.2, CL = 99.7 wide, equatorial in position. Vasa efferentia anastomosing in midline to form convoluted vas deferens; vas deferens proceeding anteriorly, dorsal to left arm of vitelline reservoir and vagina, whence it turns right and passes dorsal to ootype and cirrus pouch prior to entering cirrus pouch. Cirrus obliquely situated just posterior to pharynx. Cirrus complex consisting of cirrus and prostate reservoir in cirrus pouch. Prostate reservoir ventral to cirrus proper, with small duct leading to prostatic cells surrounding proximal end of cirrus pouch. Uterus connecting to cirrus pouch at level of posterior border of pharynx forming genital atrium, latter emptying via marginal genital pore on left just above level of pharynx. Three glands of Goto in midline just posterior to testes.

Ovary pretesticular, oval, entire, median, (9) 323 (222–419), S = 66.8, SE = 22.3, CL = 51.4 long by (9) 225 (159–291), S = 46.2, SE = 15.4, CL = 35.5 wide, with internal chamber (= seminal receptacle of Meserve, 1938) containing mature ova; oviduct passing from internal chamber, dorsal to right arm of vitelline reservoir and sinuously to ootype. Ootype obliquely situated between cirrus and vagina, surrounded by Mehlis' gland cells; uterus short, opening into genital atrium. Vagina long, with bulbous swelling at proximal end, opening marginally on left just posterior to common genital pore.

Vitellaria follicular, extending from level of prohaptoral suckers to very near posterior end of body proper. Transverse vitelloducts fusing medially to form vitelline reservoir immediately anterosinistral to ovary; vitelloducts confluent just posterior to testes. Egg *in utero* polyhedral, (1) 147 long by (1) 136 wide, with convoluted basal filament.

Brain anterodorsal to pharynx; three pairs of nerves passing into prohaptoral region. Four granular eyespots located dorsal to brain, the first pair smaller and closer together than the posterior pair. Excretory pores at level of distal end of ootype, opening dorsolaterally.

Discussion: The worms in this collection, though larger than those in the original description, are probably conspecific with *Trochopus hobo* Yamaguti, 1942. However, our population differs from Yamaguti's (1942) description in the following: (1) presence of 14 marginal hooks instead of 16; (2) presence of crescent-shaped central loculus; (3) lengths of anchors; (4) prostate reservoir inside cirrus pouch instead of outside; and (5) presence of membranous flap around each prohaptoral sucker. A small crescent-shaped central loculus was illustrated by Palombi (1949) for *Trochopus tubiporus* (Diesing, 1836), the type species of the genus. Although Yamaguti (1942) did not mention such a central loculus, he did illustrate a small slit in his drawing. The apparent discrepancy in anchor sizes as shown in Table 2 (our population, although composed of larger specimens, having smaller second and third anchors than Yamaguti's population) is hard to explain. The worms of our sample

nected to central loculus) septa, of which the posterolaterals are either trifid or bifid, with either four or six secondary (incomplete) septa. Pharynx notched marginally into eight lobes. Vagina opening close to genital pore. Parasitic on elasmobranchs and teleosts.

Type Species: *Sprostonia squatinae* (MacCallum, 1921) Bychowsky, 1957.

Discussion: The above emendation is made to accommodate *Sprostonia longiphallus* n. sp. In addition, though not mentioned by Bychowsky (1957), the pharynx of *S. squatinae* as figured by MacCallum (1921) is notched marginally into eight lobes, as is the pharynx of *S. longiphallus*. Yamaguti (1963) wrote that the vagina opened "close to, or together with, genital pore." The phrase, "or together with," should not be included in the diagnosis, as Price (1937) stated that the vagina had its opening "immediately posterior to genital aperture," and all specimens of *S. longiphallus* have vaginal openings proximal and posterior to the genital pore.

The genus *Sprostonia* Bychowsky, 1957 includes one previously described species, *S. squatinae*, described by MacCallum (1921) as *Acanthocotyle squatinae* from the host *Squatina squatina* (Linn.) from Singapore. Price (1937) redescribed it from specimens that MacCallum (1921) used for his original description, renaming it *Trochopus squatinae*. Later Price (1939) reassigned it to the genus *Megalocotyle* Folda, 1928. Brinkmann (1940), apparently in ignorance of Price's work (1936, 1937, 1939), also placed it in the latter genus. Sproston (1946) considered its inclusion in this genus as "very doubtful." Bychowsky (1957) isolated this species into the new genus *Sprostonia* Bychowsky, 1957, on the basis of (a) the more complex nature of the posthaptor with its incomplete septa and (b) the paired anterolateral suckers united anterodorsally by a common hood.

Sprostonia longiphallus new species
Figs. 11–16

Host: *Epinephelus tauvina* (Forskal), Greasy Cod or Estuary Rock-Cod; family Epinephelidae.

Locality: Gladstone, Queensland; 36 statute miles ENE of Gladstone (9 fathoms, coral).

Gear Used: Hand line.

Location: Gills.

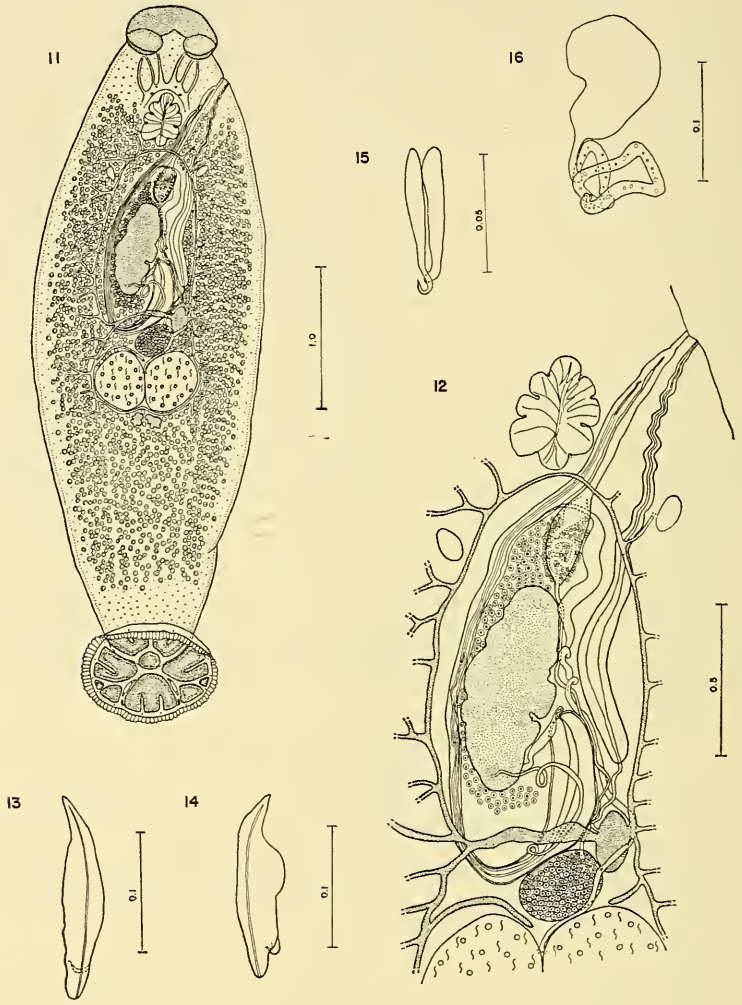
Number Studied: 83.

Number Measured: 19.

Holotype: USNM Helm. Coll. No. 71200.

Paratypes: USNM Helm. Coll. No. 71201 (five specimens).

Description: Body elliptical, flattened dorsoventrally, (19) 3,650 (2,910–4,930), S = 494, SE = 113, CL = 238 long by (19) 1,310 (1,060–1,600), S = 135, SE = 31.0, CL = 65.1 wide. Cuticle fairly thin and smooth. Prohaptor a pair of ventrolateral suckers, united anterodorsally by a common hood; left sucker (15) 143 (124–163), S = 12.4,



FIGURES 11–16. *Sprostonia longiphallus* n. sp. (Scale is in mm.) 11, Whole mount, ventral view. 12, Reproductive organs and terminal genitalia, ventral view. 13, Left first anchor. 14, Right first anchor. 15, Right second (dorsal to third anchor) and right third anchor. 16, Egg *in utero*, ventral view.

SE = 3.20, CL = 6.87 long by (15) 192 (156–231), S = 20.5, SE = 5.30, CL = 11.4 wide, right sucker (13) 141 (116–160), S = 9.58, SE = 2.66, CL = 5.79 long by (13) 184 (161–222), S = 16.3, SE = 4.52, CL = 9.86 wide. Region anterior to brain glandular. Posthaptor a subsessile, concavo-convex, oval sucker, opening ventrally, (19) 624 (514–829), S = 84.9, SE = 19.5, CL = 40.9 long by (19) 790 (626–994), S = 115, SE = 26.4, CL = 55.4 wide, divided by seven primary (connected to central loculus) septa, the posterolateral bifid, with two secondary (incomplete) septa extending inward from muscular rim subdividing posterior marginal loculus, with a secondary septum dividing each of the anterior and anterolateral marginal loculi; margin of posthaptor a strong muscular rim, surrounded by a delicate, scalloped marginal membrane (19) 52.5 (38.8–66.9), S = 8.50, SE = 1.95, CL = 4.10 wide; armed with 3 pairs of dissimilar anchors and 14 marginal hooks. First anchors large, robust, left (15) 136 (108–165), S = 17.4, SE = 4.49, CL = 9.64 long; right (16) 142 (117–174), S = 14.5, SE = 3.62, CL = 7.71 long, external tips pointed, internal blunt, and enlarged in middle; second pair of anchors elongate, left (14) 50.9 (43.9–61.0), S = 5.39, SE = 1.44, CL = 3.11 long, more robust than third pair, with tips slightly recurved, blunt; third pair of anchors elongate, left (14) 55.4 (46.9–70.2), S = 7.10, SE = 1.90, CL = 4.10 long, tips recurved and pointed. (Second and third pairs of anchors proximated, arising subequally on posthaptor and are sometimes hard to distinguish from each other.) Posthaptoral hooks (19) 6.01 (4.49–8.16), S = 0.991, SE = 0.227, CL = 0.478 long. Posthaptor sometimes with small, round, disclike sclerites near first pair of anchors.

Pharynx muscular, (19) 270 (227–367), S = 35.8, SE = 8.21, CL = 17.2 long by (19) 236 (184–281), S = 29.9, SE = 6.85, CL = 14.4 wide, constricted into eight distinct lobes. Mouth subterminal, ventral, immediately anterior to pharynx. Esophagus very short; gut bifurcated, crura with medial and lateral dendritic branching, not confluent posteriorly.

Two testes, juxtaposed, entire, fenestrated, oval in outline, left (19) 328 (263–451), S = 53.6, SE = 12.3, CL = 25.9 long by (19) 296 (217–370), S = 44.6, SE = 10.2, CL = 21.5 wide, and right (19) 327 (247–441), S = 50.6, SE = 11.6, CL = 24.4 long by (19) 289 (216–365), S = 41.2, SE = 9.45, CL = 19.9 wide, postequatorial in position. Vasa efferentia anastomosing in midline to form vas deferens, which runs anteriorly between vagina and base of cirrus pouch to level of distal end of ootype, right and posteriorly to parallel cirrus pouch, ventral to proximal end of cirrus and across posterior of prostate reservoir (which it is assumed to enter). Cirrus pouch elongate, its proximal end lying left of median line and directed anteriorly, extending diagonally across body to right of median line as far as ovary, then turning anteriorly. Cirrus very long and slender, eversible, coiled in cirrus pouch. Prostate reservoir lying in median field, right of proximal end of cirrus, and connected to cirrus by a duct which continues throughout its length as

TABLE 3. Comparison of measurements of *Sprostonia* species.

	S. squatinae MacCallum (1921)	*S. squatinae* Price (1937)	*S. longiphallus* n. sp.
Entire body (L)	4,500	2,900–3,500	2,910–4,930
(W)	1,600	1,300–1,500	1,060–1,600
Posthaptor	1,000 (dia.)	544–599 (dia.)	(L) 514–829
			(W) 626–994
Marginal membrane (W)	——	47–57	38.8–66.9
Anchor 1 (L)	140	143–148	L 108–165
			R 117–174
Anchor 2 (L)	——	24–38	L 43.9–61.0
Anchor 3 (L)	——	42	L 46.9–70.2
Hooks (L)	——	——	4.49–8.16
Prohaptoral suckers	——	(L) 95	L-(L) 124–163
		(W) 172	(W) 156–231
			R-(L) 116–160
			(W) 161–222
Pharynx	800	266 (dia.)	(L) 227–367
			(W) 184–281
Testes	1,120	L-(L) 400	L-(L) 263–451
		(W) 340	(W) 217–370
		R(dia.) 340	R-(L) 247–441
			(W) 216–365
Ovary	480	190 (dia.)	(L) 124–208
			(W) 187–278
Egg	140	(W) 120	(L) 105
			(W) 68.5–79.4

(L) = Length. (W) = Width. L = Left. R = Right. (dia.) = diameter.

ejaculatory duct. Prostatic cells surround prostate reservoir except on left. Cirrus pouch joining uterus near margin to form genital atrium opening to outside via the common marginal genital pore on left at anterior level of brain. Glands of Goto irregular in outline, on each side of midline posterior to testes.

Ovary immediately pretesticular, oval, entire, median, (19) 170 (124–208), S = 22.2, SE = 5.09, CL = 10.7 long by (19) 233 (187–278), S = 29.6, SE = 6.79, CL = 14.3 wide, having internal chamber (= seminal receptacle of Meserve, 1938) containing mature ova; oviduct passing from chamber dorsal to right arm of vitelline reservoir, ventral to vas deferens on left to proximal end of cirrus, then dorsal to vas deferens and ootype. Ootype oblique, between cirrus and vagina, surrounded by Mehlis' gland cells; uterus very long, opening into genital atrium. Vagina muscular, elongate, wavy near distal end, with base at level of posterior end of prostate reservoir, opening marginally just posterior to common genital pore; connected by small duct to right side of vitelline reservoir.

Vitellaria follicular, extending from level of anterior part of pharynx to near posterior end of body. Transverse vitelloducts fusing to left of median line to form vitelline reservoir immediately anterolateral to ovary. Vitelloducts confluent postpharyngeally and posttesticularly. Egg *in utero* polyhedral, (2) 105 long by (2) 74.0 (68.5–79.4) wide, with convoluted basal filament.

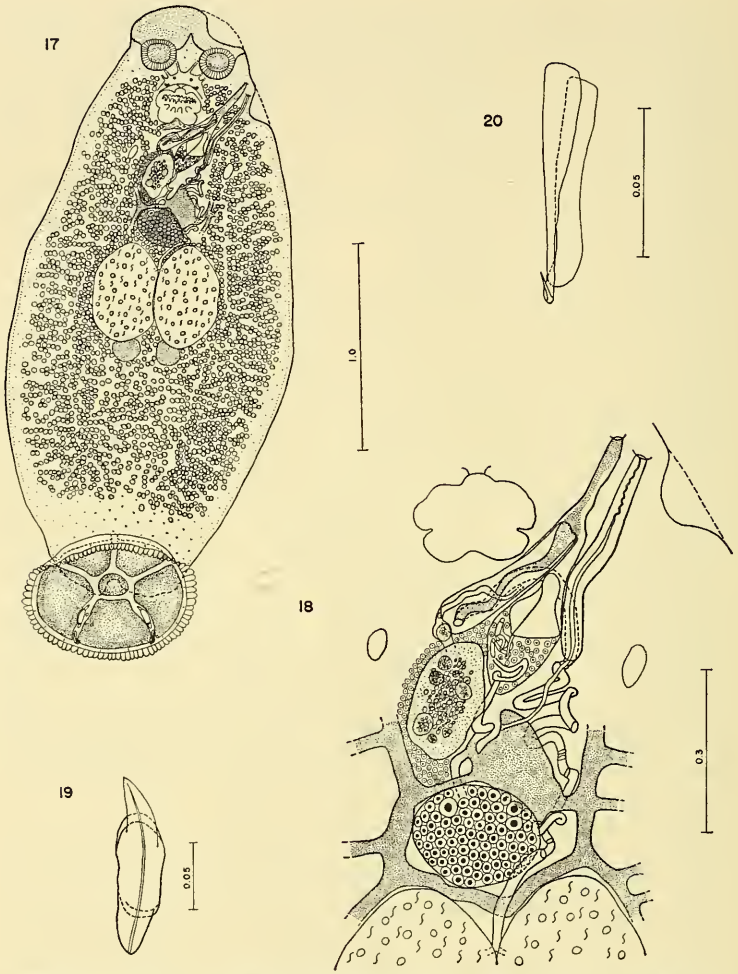
Brain anterior to pharynx, three pairs of nerves passing into prohaptoral region. Four granular eyespots dorsal to brain, first pair smaller and closer together than posterior pair. Excretory pores at level of anterior of ootype, opening dorsolaterally.

Discussion: The present species is very similar to *Sprostonia squatinae* (MacCallum, 1921) Bychowsky, 1957, from the gills of *Squatina squatina* (Linn.), but differs in the following respects: (1) glands of Goto present; (2) vitelloducts confluent postpharyngeally and posttesticularly; (3) testes fenestrated; (4) posterolateral septa bifid instead of trifid; (5) second and third pairs of anchors larger (Table 3); (6) prohaptoral suckers larger (Table 3); (7) egg smaller (Table 3); (8) vas deferens passing dorsal to left arm of vitelline reservoir and ventral to prostate reservoir, which it apparently enters; (9) proximal end of vagina more anterior and also connected by a small duct to the right side of the vitelline reservoir; and, (10) host.

The septation of the posthaptor is very close to that described by Price (1937) for *Sprostonia squatinae* (MacCallum, 1921) Bychowsky, 1957. The major difference is that the posterolateral septa are bifid instead of trifid. This observation was facilitated by the use of eosin as a counterstain on several specimens. It is possible that Price (1937) observed something similar to the "obsolescent radii devoid of special musculature," described by Johnston (1930a) for *Macrophyllida antarctica,* passing from the anterolateral secondary septa to the posterolateral bifid septa instead of an actual elevated septum. Such radii were observed on several of the specimens in our sample.

There is some confusion over anchor classification in the paper by Price (1937), where those designated as the second and third pairs are really the third and second, respectively. In other Trochopodinae the coarse, slightly-curved and blunt-tipped anchor is designated as the second anchor while the finer anchor with the recurved and sharp tip is the third. In many capsalids these anchors do occupy the second and third positions behind the first anchor along the anteroposterior axis of the posthaptor. In *Sprostonia,* however, they lie side-by-side rather than in tandem. The terms "second anchor" and "third anchor" denote specific morphological entities with definite embryological histories as do "femur" and "tibia" in vertebrate anatomy. They cannot be mixed. The arrangement of the posterior two pairs of anchors in *Sprostonia* Bychowsky, 1957 can thus be best explained by a migration backward of the second pair or a migration forward of the third pair, resulting in their lying side-by-side.

This description increases the number of species in the genus *Sprostonia*



FIGURES 17–20. *Allosprostonia tauvinae* n. gen., n. sp. (Scale is in mm.) 17, Whole mount, ventral view. 18, Reproductive organs and terminal genitalia, ventral view. 19, Left first anchor. 20, Left second (dorsal to third anchor) and left third anchor.

Bychowsky, 1957 to two: the type species from *Squatina squatina* (Linn.) (Singapore, Malaysia); and *S. longiphallus* n. sp. from *Epinephelus tauvina* (Forskal) (Gladstone, Queensland, Australia). This nonrigid supraspecificity (Hargis, 1957) of *Sprostonia* Bychowsky, 1957 could possibly represent paleoecological or neoecological relationships between the hosts.

A total of 83 parasites was recovered from 7 host specimens (Table 6).

Allosprostonia tauvinae new genus, new species
Figs. 17–20

Host: Epinephelus tauvina (Forskal), Greasy Cod or Estuary Rock-Cod; family Epinephelidae.

Locality: Gladstone, Queensland; 36 statute miles ENE of Gladstone (9 fathoms, coral).

Gear Used: Hand line.

Location: Gills.

Number Studied and Measured: 2.

Holotype: USNM Helm. Coll. No. 71202.

Paratype: USNM Helm. Coll. No. 71203.

Description: Body elliptical, flattened dorsoventrally, 2,860 (2,620–3,100) long by 1,250 (1,140–1,360) wide. Cuticle fairly thin and smooth. Prohaptor a pair of ventrolateral suckers, united anterodorsally by a common hood; left sucker 142 (125–159) long by 161 (151–172) wide and right sucker 148 (136–161) long by 164 (154–175) wide. Head glands in three major areas, in body between prohaptoral suckers and posterolateral to each sucker. Posthaptor a subsessile, concavo-convex, oval sucker, opening ventrally, 607 (518–696) long by 782 (712–851) wide, divided by five septa into one central and five peripheral depressions (loculi); margin of posthaptor a strong muscular rim, surrounded by a delicate, scalloped marginal membrane 49.2 (46.5–51.8) wide; armed with 3 pairs of dissimilar anchors and 14 marginal hooks. First anchors large, robust, left of larger specimen 128 long and right of larger specimen 122 long, with pointed external tips and blunt internal tips and enlarged in the middle; second pair of anchors elongate, left of larger worm 75.1 long and right of smaller worm 65.3 long, more robust than third pair with slightly recurved blunt tips; third pair of anchors elongate, left of larger worm 81.8 long and right of smaller worm 70.0 long, tips recurved and pointed. (Second and third pairs of anchors lie side by side, arising at about the same level on the posthaptor, being sometimes hard to distinguish from each other.) Posthaptoral hooks 6.12 long. Small, round, disclike sclerites on posthaptor near first pair of anchors.

Pharynx muscular, 168 (163–172) long by 215 (204–226) wide, constricted (or notched) into five distinct lobes, papillated internally. Mouth subterminal, ventral, immediately anterior to pharynx. Esophagus very short; gut bifurcated, crura with medial and lateral dendritic branching, not confluent posteriorly.

Two testes, juxtaposed, entire, fenestrated, oval in outline, left slightly larger, 483 (471–494) long by 324 (319–330) wide, than right, 468 (454–482) long by 301 (293–309) wide, equatorial in position. Vasa efferentia anastomising in midline to form vas deferens; vas deferens proceeding anteriorly dorsal to left margin of ovary and left arm of

vitelline reservoir and vagina whence it turns right and passes dorsal to cirrus pouch, entering it near the proximal end. Vas deferens convoluted from level of ovary to proximal end of vagina, where it straightens out. Seminal vesicle a continuation of the vas deferens in the ventral side of the cirrus. Cirrus obliquely situated just posterior to pharynx, 293 (281–304) long by 70.7 (70.0–71.4) wide. Cirrus complex consisting of cirrus, ejaculatory duct, and seminal vesicle in cirrus pouch. Prostate reservoir separate from cirrus complex, on right side of body extending longitudinally between proximal end of cirrus pouch and ovary, containing strongly developed prostatic cells; duct passing from anterior end of prostate reservoir around proximal end of cirrus and continuing ventrally in cirrus. Prostatic cells around prostate reservoir except for left side. Uterus connecting to cirrus pouch immediately at distal end of cirrus forming a genital atrium opening outside via the common submarginal genital pore on left above level of pharynx. Glands of Goto on each side of the midline immediately posterior to testes.

Ovary pretesticular, oval, entire, median, 173 (153–192) long by 196 (163–229) wide, having internal chambers (= seminal receptacle of Meserve, 1938) containing mature ova; oviduct passing from internal chambers dorsal to right arm of vitelline reservoir and connecting to duct coming from right side of reservoir, proceeding anteriorly to ootype. Ootype obliquely situated between cirrus and vagina, surrounded by Mehlis' gland cells; uterus short, opening into genital atrium. Vagina muscular, passing anteriorly to distal end of ootype, turning left and continuing to submarginal pore directly posterior to common genital pore, probably connected via a small duct to anterior end of vitelline reservoir.

Vitellaria follicular, extending from level of anterior pair of eyespots to near posterior end of body. Transverse vitelloducts fusing medially to form vitelline reservoir immediately anterolateral to ovary. Transverse vitelloduct separating ovary from testes. Egg *in utero* polyhedral, 136 long by 125 wide, with convoluted basal filament.

Brain anterior to pharynx; three pairs of nerves passing into prohaptoral region. Four granular eyespots located dorsal to brain, first pair smaller and closer together than posterior pair. Excretory pores posterior to level of proximal end of vagina, opening dorsolaterally.

Allosprostonia new genus

Diagnosis: Trochopodinae. Body elliptical, flattened dorsoventrally. Prohaptor a pair of anterolateral suckers united anterodorsally by a common hood. Prohaptor subsessile, with scalloped marginal membrane; ventral surface divided by five septa into central loculus and five peripheral loculi. Three pairs of dissimilar anchors (posterior two pairs, the second and third anchors, lying side by side) and 14 marginal hooks. Two pairs of eyes. Pharynx constricted (or notched) into five distinct lobes. Intestinal crura with medial and lateral dendritic branches, not

confluent posteriorly. Two testes, fenestrated, juxtaposed. Vas deferens joining seminal vesicle in cirrus pouch. Prostatic reservoir strongly developed, outside of and connected to cirrus pouch. Cirrus short. Common genital atrium opening near left margin of body below left prohaptor. Ovary oval, median, pretesticular, separated from testes by a transverse vitelloduct. Ootype surrounded proximally by Mehlis' gland cells; uterine egg with a single, convoluted polar filament. Vagina fairly long, tubular, slightly swollen proximally, and probably united with vitelline reservoir by a narrow duct; vaginal opening close to genital pore submarginally. Vitellaria co-extensive with intestinal branches; vitelline reservoir large, immediately anterolateral to ovary. Parasitic on marine teleosts.

Type Species: Allosprostonia tauvinae n. sp.

Discussion: Allosprostonia n. gen. varies from every other group of the subfamily Trochopodinae (Price, 1936) Sproston, 1946 in characters that are presently regarded as generic in rank: (1) posthaptor divided by five septa into one central and five peripheral loculi; (2) prohaptor consists of a pair of anterolateral suckers united anterodorsally by a common hood; (3) genital openings slightly submarginal; and, (4) pharynx constricted into five lobes.

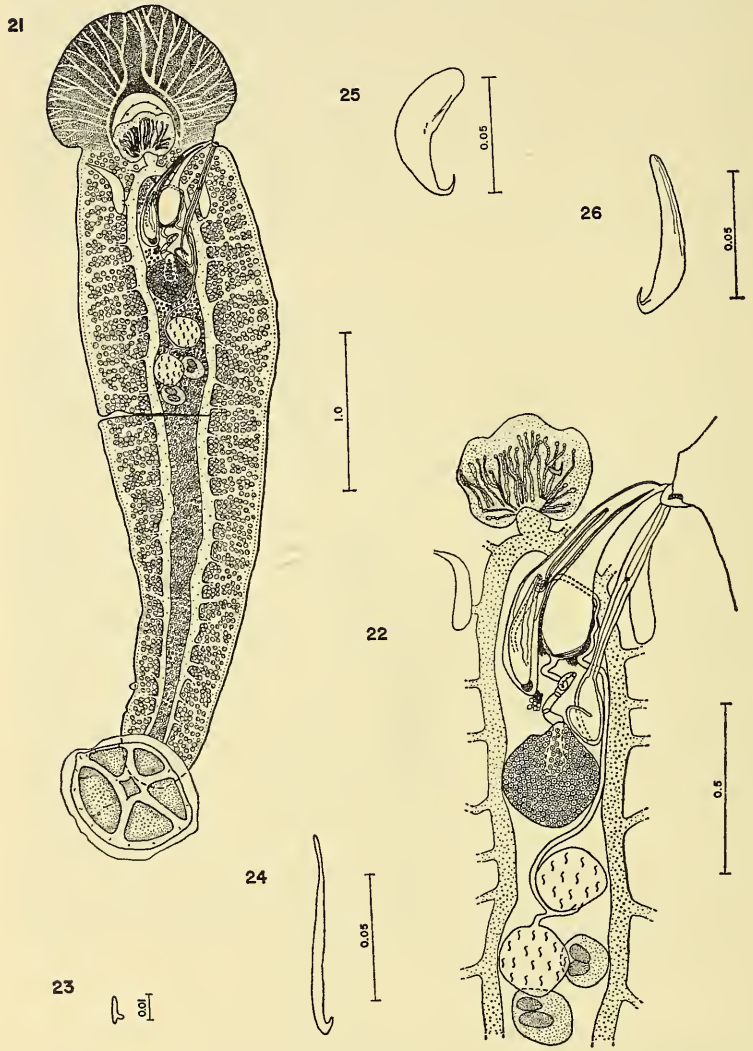
Allosprostonia tauvinae n. sp. is apparently related to *Sprostonia* Bychowsky, 1957 in that it also possesses: (1) a pair of anterolateral suckers united anterodorsally by a common hood; (2) strongly developed prostate reservoir lying longitudinally between the cirrus and the ovary; and, (3) three pairs of anchors similar in shape and location (the posterior two pairs, the second and third anchors, lying side by side). It is significant that *Allosprostonia tauvinae* n. sp. was found on the same host as *Sprostonia longiphallus* n. sp. Although *Macrophyllida antarctica* (Hughes, 1928) Johnston, 1929 also has five septa, these are more weakly developed (see redescription below) and the anchors, rather than being in the posterolateral septa, are in the posterior loculus on obsolescent radii devoid of special musculature (Johnston, 1930a). The five septa of *Allosprostonia tauvinae* n. sp. are considered homologous to the five septations of *Sprostonia* Bychowsky, 1957 which originate around the central loculus. Because of the apparent close relationship between *Sprostonia* Bychowsky, 1957 and the present species, the name *Allosprostonia tauvinae* n. gen., n. sp. is proposed.

Two parasites were collected from seven host specimens (Table 6).

Genus *Macrophyllida* Johnston, 1929, *emend.*

Synonym: Macrophylla Hughes, 1928.

Diagnosis: Trochopodinae. Diagnosis that of Yamaguti (1963) except as follows: (1) posthaptor bearing three pairs of anchors; anterior pair at junction of posterior septa with that surrounding central loculus, two posterior pairs in large posterior loculus; (2) vasa efferentia coming from anterior margin of right testis and posterior margin of left; (3) glands of Goto present to left and posterior to right testis; (4) cirrus,



FIGURES 21–26. *Macrophyllida antarctica* (Hughes, 1928) Johnston, 1929. (Scale is in mm.) 21, Whole mount, ventral view (posthaptor twisted bringing posterior anchor-bearing loculus slightly out of alignment in the clockwise direction). 22, Reproductive organs and terminal genitalia, ventral view. 23, Left first anchor. 24, Right second anchor. 25, Right third anchor. 26, Right third anchor.

uterus, and vagina opening close together in marginal depression on left at posterior level of pharynx; and, (5) vaginal opening separate from, but close to, common genital pore.

Type Species: *Macrophyllida antarctica* (Hughes, 1928) Johnston, 1929.

Discussion: The above emendation was made in order to correct the generic diagnosis of *Macrophyllida* Johnston, 1929, as given by Yamaguti (1963).

Hughes (1928) described a new genus and species, *Macrophylla antarctica,* from the gills of the Gummy Shark, *Mustelus antarcticus,* from Port Phillip Bay, Victoria, Australia. She found this species on only two host specimens of about 100 examined. As the generic name was found to be preoccupied, *Macrophyllida* was proposed in its place by Johnston (1929), who later (1930a) redescribed and figured the species from specimens sent to him by Dr. O. W. Tiegs.

Macrophyllida antarctica (Hughes, 1928) Johnston, 1929
Figs. 21–26

Synonym: *Macrophylla antarctica* Hughes, 1928.

Host: *Mustelus antarcticus* Gunther, Gummy Shark; family Galeorhinidae.

Locality: Dunalley, Tasmania; 30 statute miles ENE of Hobart (15 fathoms, weed/mud).

Previously Reported Host and Locality: *Mustelus antarcticus* Gunther; Port Phillip Bay, Victoria, Australia.

Gear Used: Danish seine.

Location: Gills.

Number Studied: 2.

Number Measured: 1.

Homoeotype: USNM Helm. Coll. No. 71204.

Redescription: Body elongate, flattened dorsoventrally, 5,510 long by 1,250 wide. Cuticle fairly thin and smooth. Anterior end broadly rounded, separated from rest of body by constrictions on each side at level of midpoint of pharynx, with pair of extensive glandular areas almost meeting in front, extending backwards around pharynx to near its posterior margin, and containing numerous ducts; greatest width of prohaptoral region 1,220. Posthaptor a subsessile, concavo-convex, nearly circular sucker, opening ventrally, diameter 962, divided by five weakly developed septa into one central and five peripheral loculi; margin of posthaptor a weak muscular rim surrounded by marginal membrane up to 111 wide; armed with 3 pairs of dissimilar anchors, first pair at junction of posterolateral septa with that surrounding central loculus, and the second and third pairs of anchors located in the large posterior loculus; and 14 marginal hooks. First anchors minute, left 9.59 long, external tips blunt, internal tips bifid; second pair of anchors elongate, slender, left 82.0 long and right 79.4, with blunt slightly recurved tips;

third pair of anchors elongate, wider than second, right 61.8 long, with recurved sharp tips. (Posthaptor with large cell between second and third anchors.) Posthaptoral hooks 10.8 long, each with a domus.

Pharynx muscular, 329 long by 403 wide, margin partially constricted, containing long, slender cells internally. Mouth subterminal, ventral, anteroproximal to pharynx. Esophagus short; gut bifurcated, crura with only lateral dendritic branching, not confluent posteriorly.

Testes two, oval, entire, obliquely tandem, left smaller, 210 long by 214 wide, diagonally anterior to right, latter 210 long by 223 wide, preequatorial in position. Vasa efferentia emerging from anteromedial margin of right testis, posterior margin of left, and fusing to right of left at its posteromedial margin to form vas deferens. Latter running to left of ovary, dorsal to vagina and distal end of ootype, then right to pass dorsally to cirrus (entrance of vas deferens in cirrus not seen). Ejaculatory duct (origin not evident) running inside cirrus to its tip. Cirrus subobliquely situated between right crus of intestine and ootype. Cirrus complex consisting of a sclerotized cirrus and prostate reservoir at proximal end of cirrus in cirrus pouch. Several large prostatic cells outside cirrus pouch, connected by small ducts to prostate reservoir. Uterus connecting to cirrus pouch very near left margin, forming genital atrium opening outside via common marginal genital pore on left at level of posterior margin of pharynx. Glands of Goto oval, large, situated next to and slightly dorsal to right testis.

Ovary pretesticular, entire, nearly circular except for anterior extension, 309 long by 287 wide, having internal chamber (= seminal receptacle of Meserve, 1938) containing mature ova; convoluted oviduct passing from internal chamber to proximal end of ootype. Ootype obliquely situated between cirrus and vagina, surrounded by Mehlis' gland cells; uterus thick-walled, tapering distally, opening into genital atrium. Vagina long, slender, looped immediately anterolateral to ovary, containing duct with constriction at level of distal end of ootype (constriction apparently surrounded by circular muscles and conceivably functioning as a sphincter); opening proximal to genital pore into a common ventral marginal depression having a muscular vaginal lip.

Vitellaria follicular, extending from near posterior level of pharynx almost to end of body, smaller in intercecal field than in extracecal. Vitelline reservoir(s) not observed. Egg not observed.

Brain anterior to pharynx. Four granular eyespots dorsal to brain, first pair smaller and closer together than posterior pair. Excretory pores opening dorsolaterally near margin at posterior level of pharynx.

Discussion: The worms in this collection appear conspecific with *Macrophyllida antarctica* (Hughes, 1928) Johnston, 1929.

Though smaller than those in the original description (Table 4), the worm measured is considered mature due to the presence of mature ova. The worms in the present collection differ from Hughes' (1928) description in the following: (1) presence of large glands of Goto; (2) possession of a small anterior pair of anchors on the posthaptor; (3) vas

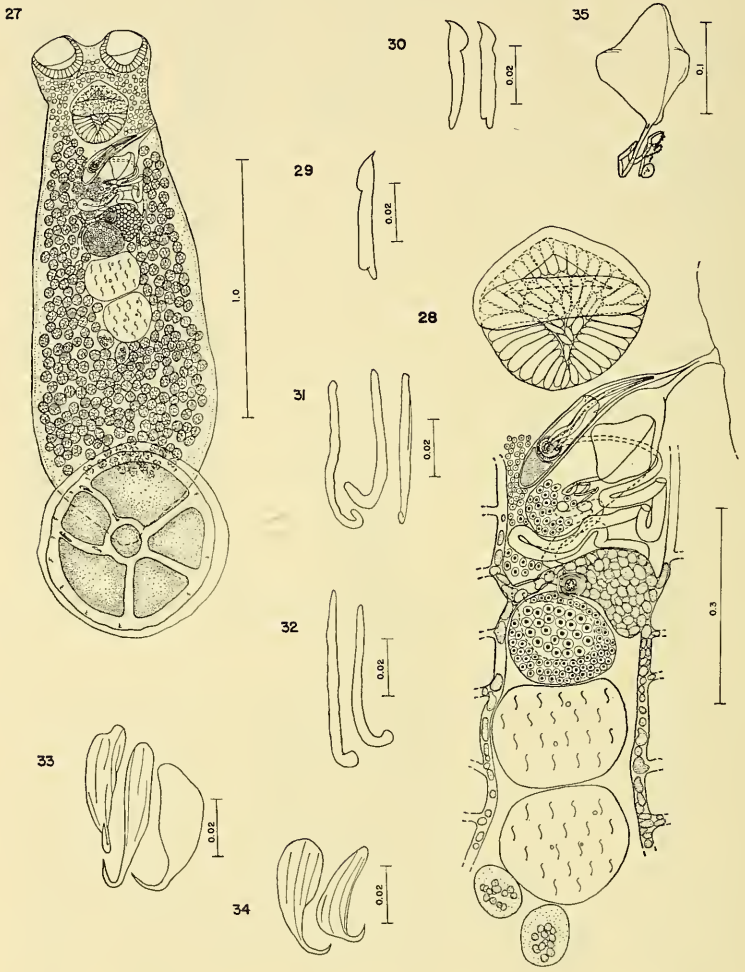
TABLE 4. Comparison of measurements of *Macrophyllida antarctica* (Hughes, 1928) Johnston, 1929.

	Hughes (1928)	Johnston (1930a)	Present sample
Entire body (L)	13,150	14,800	5,510
(W)	1,300–2,500	2,800	1,250
Posthaptor	——	2,000	962
Marginal membrane (W)	——	——	111
Anchor 1 (L)	——	——	L 9.59
Anchor 2 (L)	——	95	L 82
			R 79.4
Anchor 3 (L)	——	——	R 61.8
Hooks (L)	——	——	10.8
Prohaptoral region (W)	——	——	1,220
Pharynx (L)	——	700	329
(W)	——	850	403
Testes L-(L)	——	600	210
(W)	——	360	214
R-(L)	——	600	210
(W)	——	450	223
Ovary (L)	——	600 (dia.)	309
(W)	——	——	287
Egg (L)	220	——	——
(W)	107	——	——

(L) = Length. (W) = Width. L = Left. R = Right. (dia.) = diameter.

efferens from left testis coming from the posterior margin instead of the anterior; and, (4) the presence the 14 marginal hooks, each having a domus (Llewellyn, 1963). Hughes (1928) also illustrated Laurer's canals near the posterior end of the body proper in her figure. These, in reality, are lateral branches of the gut and not Laurer's canals, which are found in digenetic trematodes. Johnston (1930a) mentioned the other obvious mistake of Hughes (1928), who mistook the uterus for the vagina, but failed to mention items 1, 2, and 4 above in his redescription. Both Hughes (1928) and Johnston (1930a) indicated that the vas efferens emerges from the anterior margin of the left testis. In our specimens it comes from the posterior margin. The connection of the vas efferens to the left testis in this fashion can best be explained by a rotation of this testis 180 degrees to the right, resulting in the tandem arrangement of the testes. This is further evidenced by the left gland of Goto moving forward to lie next to the right testis and posterior to the left.

The nature of the genital openings as described Johnston (1930a) and Yamaguti (1963) is not clear. According to Johnston (1930a) there are three sex apertures. Yamaguti (1963) wrote "cirrus, uterus and



FIGURES 27–35. *Mediavagina forsteri* n. gen., n. sp. (Scale is in mm.) 27, Whole mount, ventral view (posthaptor twisted bringing posterior loculus about 125° out of alignment in the clockwise direction). 28, Reproductive organs and terminal genitalia, ventral view. 29, Left first anchor. 30, Right first anchor. 31, Left second anchor. 32, Right second anchor. 33, Left third anchor. 34, Right third anchor. 35, Egg *in utero*, ventral view.

vagina opening close together into muscular common genital atrium which in turn opens on the left margin." In the two worms of the present collection the genital atrium is formed by the junction of the cirrus pouch and the uterus close to the left margin. The vagina opens near but posterior to and separate from the genital pore in the depression. The common genital pore is directed somewhat posteriorly and the vaginal pore anteriorly. A single vaginal lip (Johnston, 1930a stated that two such lips occurred in his sample) is situated on the anterolateral edge of the depression.

The presence of the large cells between the posterior two pairs of anchors as mentioned by Johnston (1930a) is verified in this study. Johnston stated that this cell was probably a multipolar nerve cell. Its function is unknown. Johnston also noted a resemblance of the long gland cells of the pharynx with those described by Heath (1902) from *Entobdella squamula* (Heath, 1902) Johnston, 1929. They have a large nucleus and a granular protoplasm which stains well.

Sproston (1946) mentioned "the two posterior radii of typical Capsalids being virtually suppressed" in referring to those radii on which the posterior two pairs of anchors are located. Johnston (1930a) wrote that the disc of *M. antarctica* (Hughes, 1928) Johnston, 1929, has five peripheral depressions and the "posterior loculus is large and is crossed by two obsolescent radii devoid of special musculature." Bychowsky (1927) considered these rays to represent the disappearing posterior septa of the rest of *Megalocotyle* as supported by the presence of anchors in them. We accept Bychowsky's theory.

Two parasites were recovered from 17 host specimens (Table 6). This monotypic genus occurs on *Mustelus antarcticus* of the family Galeorhinidae.

Mediavagina forsteri new genus, new species
Figs. 27–35

Host: *Latridopsis forsteri* (Castelnau), Silver Trumpeter or Bastard Trumpeter; family Latridae.

Locality: Hobart, Tasmania; 25 statute miles E of Hobart (2–3 fathoms, mud).

Gear Used: Gill net.

Location: Gills.

Number Studied: 14.

Number Measured: 11.

Holotype: USNM Helm. Coll. No. 71205.

Paratypes: USNM Helm. Coll. No. 71206 (two specimens).

Description: Body elliptical, flattened dorsoventrally, (9) 1,880 (1,490–2,340), S = 307, SE = 102, CL = 236 long by (9) 573 (356–712), S = 135, SE = 44.9, CL = 104 wide. Cuticle fairly thin and smooth. Prohaptor a pair of slightly pedunculated ventrolateral suckers, united in the median prepharyngeal region; left sucker (8) 169 (139–206), S = 23.5, SE = 8.32, CL = 19.7 long by (8) 175 (130–210),

TABLE 5. Comparison of measurements of *Mediavagina* species.

	M. foresteri n. sp.	*M. macropteri* n. sp.
Entire body (L)	1,490–2,340	2,560–3,140
(W)	356–712	518–699
Posthaptor (L)	358–720	568–756
(W)	360–746	605–766
Marginal membrane (W)	24.5–55.5	59.3–63.3
Anchor 1 L-(L)	26.7–40.8	34.2–38.0
R-(L)	26.1–37.3	31.0–39.0
Anchor 2 L-(L)	46.9–74.9	58.9–72.8
R-(L)	50.0–76.5	54.9–66.0
Anchor 3 L-(L)	38.6–51.4	37.3–44.3
R-(L)	37.3–51.8	——
Prohaptoral suckers L-(L)	139–206	258–260
(W)	130–210	213–239
R-(L)	151–197	256–282
(W)	120–216	218–265
Pharynx (L)	121–265	190–226
(W)	114–265	175–183
Testes: Anterior (L)	112–240	97.9–129
(W)	117–255	76.2–114
Posterior (L)	111–211	90.1–142
(W)	100–224	71.1–101
Ovary (L)	73.6–143	155–196
(W)	92.6–168	140–172
Egg (L)	108–126	112–142
(W)	86.5–105	88.4–115

(L) = Length. (W) = Width. L = Left. R = Right.

S = 23.7, SE = 8.37, CL = 19.8 wide, right sucker (8) 169 (151–197), S = 16.1, SE = 5.70, CL = 13.5 long by (9) 178 (120–216), S = 29.8, SE = 9.94, CL = 22.9 wide. Region before posterior border of pharynx glandular. Posthaptor a subsessile, concavo-convex, oval sucker, opening ventrally, (10) 565 (358–720), S = 111, SE = 35.2, CL = 79.6 long by (10) 624 (360–746), S = 138, SE = 43.7, CL = 98.8 wide, divided by five weakly-developed septa into one central and five peripheral depressions (loculi); margin of posthaptor a muscular rim surrounded by a delicate marginal membrane (10) 42.1 (24.5–55.5), S = 11.9, SE = 3.77, CL = 8.53 wide; armed with 3 pairs of dissimilar anchors and 14 marginal hooks. First anchors fairly small, robust, left

(7) 31.1 (26.7–40.8), S = 5.28, SE = 2.00, CL = 4.89 long and right (4) 32.8 (26.1–37.3) long, with external tips knobbed and pointed, internal bifid; second pair elongate, with slightly recurved blunt tips, left (6) 62.1 (46.9–74.9), S = 9.08, SE = 3.71, CL = 9.53 long and right (6) 63.8 (50.0–76.5), S = 9.53, SE = 3.89, CL = 10.0 long, more robust than third pair; third anchors elongate, left (4) 45.6 (38.6–51.4) long and right (4) 45.0 (37.3–51.8) long, tips recurved and pointed.

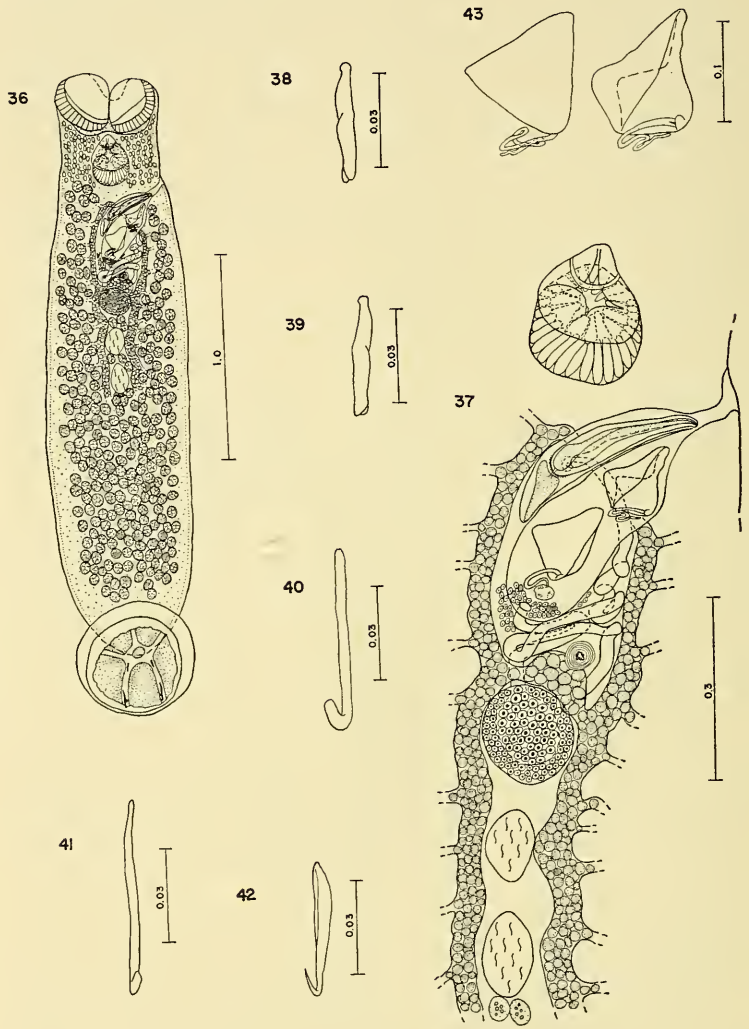
Pharynx muscular, (11) 213 (121–265), S = 50.0, SE = 15.1, CL = 33.6 long by (11) 195 (114–265), S = 49.7, SE = 15.0, CL = 33.4 wide. Mouth subterminal, immediately anteroventral to pharynx. Esophagus short; gut bifurcated, crura with medial and lateral dendritic branching, not confluent posteriorly.

Testes two, tandem, entire, slightly fenestrated, oval in outline, anterior (11) 162 (112–240), S = 32.5, SE = 9.79, CL = 21.8 long by (11) 181 (117–255), S = 35.3, SE = 10.6, CL = 23.7 wide, posterior (11) 155 (111–211), S = 29.1, SE = 8.77, CL = 19.5 long by (11) 168 (100–224), S = 32.6, SE = 9.82, CL = 21.9 wide, equatorial in position. Vasa efferentia not observed. Vas deferens traced from dorsal to left side of vitelline reservoir forward, proceeding right and turning left just posterior to ootype, becoming convoluted, extending to distal end of ootype where it straightens, then executes a wide loop, passing dorsal to ootype and entering cirrus dorsally. Cirrus obliquely situated just posterior to pharynx. Cirrus complex consisting of cirrus, seminal vesicle, ejaculatory duct, and prostate reservoir in cirrus pouch. Prostatic cells around prostate reservoir. Uterus connecting to cirrus pouch near left margin, opening to genital atrium via common marginal genital pore on left at posterior level of pharynx. Glands of Goto in midline, variable in position, either posterior to, or to right of, posteriormost testis.

Ovary pretesticular, oval, entire, median, (11) 117 (73.6–143), S = 24.1, SE = 7.26, CL = 16.2 long by (11) 138 (92.6–168), S = 23.9, SE =7.19, CL = 16.0 wide, having internal chamber (= seminal receptacle of Meserve, 1938) containing mature ova; oviduct passing from internal chamber dorsal to right arm of vitelline reservoir and sinuously to ootype. Connection of vitelline reservoir to oviduct not observed. Ootype obliquely situated immediately posterior to cirrus pouch, surrounded by Mehlis' gland cells; uterus short, opening into genital atrium. Vaginal pore between vitelline reservoir and ovary, median in position. Vaginal tube not observed.

Vitellaria large and follicular, extending from posterior level of pharynx to near posterior end of body. Transverse vitelloducts fusing medially to form vitelline reservoir immediately anterolateral to ovary. Egg *in utero* polyhedral, (7) 121 (108–126), S = 6.24, SE = 2.36, CL = 5.77 long by (7) 98.9 (86.5–105), S = 6.43, SE = 2.43, CL = 5.94 wide, with convoluted basal filament.

Brain dorsal to anterior part of pharynx. Four granular eyespots located dorsal to brain, first pair smaller and closer together than posterior pair.



FIGURES 36–43. *Mediavagina macropteri* n. sp. (Scale is in mm.) 36, Whole mount, ventral view. 37, Reproductive organs and terminal genitalia, ventral view. 38, Left first anchor. 39, Right first anchor. 40, Left second anchor. 41, Right second anchor. 42, Left third anchor. 43, Egg *in utero*, ventral view.

Mediavagina macropteri new species
Figs. 36–43

Host: Nemadactylus macropterus (Bloch and Schneider), Jackass Fish or Tarakihi; family Cheilodactylidae.

Locality: Lakes Entrance, Victoria; 45 statute miles ESE of Lakes Entrance (65–75 fathoms).

Gear Used: Danish seine.

Location: Gills.

Number Studied: 5.

Number Measured: 4.

Holotype: USNM Helm. Coll. No. 71207.

Paratypes: USNM Helm. Coll. No. 71208 (two specimens).

Description: Body elliptical, flattened dorsoventrally, (3) 2,800 (2,560–3,140) long by (3) 587 (518–699) wide. Cuticle fairly thin and smooth. Prohaptor a pair of slightly pedunculated ventrolateral suckers, united in median prepharyngeal region; left sucker (2) 259 (258–260) long by (2) 226 (213–239) wide, right sucker (2) 269 (256–282) long by (2) 241 (218–265) wide. Region anterior to posterior border of pharynx glandular. Posthaptor a subsessile, concavo-convex, oval sucker, opening ventrally, (4) 674 (568–756) long by (4) 689 (605–766) wide, divided by five weakly-developed septa into one central and five peripheral depressions (loculi); margin of posthaptor a muscular rim, surrounded by a delicate marginal membrane, (2) 61.3 (59.3–63.3) wide; armed with 3 pairs of dissimilar anchors and 14 marginal hooks. First anchors fairly small, robust, left (4) 36.3 (34.2–38.0) long and right (4) 35.9 (31.0–39.0) long, external tips knobbed, internal tips bifid; second pair elongate, left (3) 65.0 (58.9–72.8) long, right (3) 61.1 (54.9–66.0) long, more robust than third pair, tips slightly recurved and blunt; third pair of anchors elongate, left (2) 40.8 (37.3–44.3) long, tips recurved and pointed.

Pharynx muscular, (3) 205 (190–226) long by (3) 178 (175–183) wide. Mouth subterminal, immediately anteroventral to pharynx. Esophagus short; gut bifurcated, crura with medial and lateral dendritic branching, not confluent posteriorly.

Two tandem testes, entire, oval in outline, anterior (4) 114 (97.9–129) long by (4) 87.8 (76.2–114) wide, and posterior (4) 117 (90.1–142) long by (4) 83.8 (71.1–101) wide, equatorial in position. Vasa efferentia not observed. Vas deferens traced from dorsal to left side of vitelline reservoir forward, looping just posterior to ootype, passing sinuously to left of ootype before running dorsal to ootype and entering cirrus dorsally. Seminal vesicle a continuation of the vas deferens in the ventral side of the cirrus. Cirrus obliquely situated just posterior to pharynx. Cirrus complex consisting of cirrus, seminal vesicle, and prostate reservoir in cirrus pouch. Prostatic cells around prostate reservoir. Small duct from prostate reservoir leading to large duct in cirrus passing dorsal to seminal vesicle and leading to end of cirrus. Uterus connecting to

TABLE 6. Occurrence of parasites reported on their hosts.

Hosts					Parasites					
Name	No. Spec.	Field No.	Nearest Town	Station	*Trochopus hobo*	*Sprostonia longiphallus*	*Allosprostonia tauvinae*	*Macrophyllida antarctica*	*Mediavagina forsteri*	*Mediavagina macropteri*
Chelidonichthys kumu	9	W-561	Tweed Heads	C	—	—	—	—	—	—
	20	W-587	Lakes Entrance	M	19	—	—	—	—	—
Epinephelus tauvina	2	534	Gladstone	B	—	16	—	—	—	—
	2	535	Gladstone	B	—	33	2	—	—	—
	1	536	Gladstone	B	—	8	—	—	—	—
	2	543	Gladstone	B	—	26	—	—	—	—
Mustelus antarcticus	6	615	Dunalley	P	—	—	—	2	—	—
	11	643	Port Kenney	U	—	—	—	—	—	—
Latridopsis forsteri	21	599	Hobart	O	—	—	—	—	14	—
Nemadactylus macropterus	30	585	Lakes Entrance	M	—	—	—	—	—	5
	1	609	Ulladulla	H	—	—	—	—	—	—
					19	83	2	2	14	5

cirrus pouch near left margin forming a genital atrium opening via the common marginal genital pore on left at level of posterior border of pharynx. Glands of Goto in midline, slightly to the right and posterior to posteriormost testis.

Ovary pretesticular, oval, entire, median, (4) 169 (155–196) long by (4) 151 (140–172) wide, having internal chamber (= seminal receptacle of Meserve, 1938) containing mature ova; oviduct passing from internal chamber dorsal to right arm of vitelline reservoir and making a loop on left of ootype before entering it. Connection of vitelline reservoir to oviduct not observed. Ootype obliquely situated immediately posterior to cirrus pouch, surrounded by Mehlis' gland cells; uterus short, opening into genital atrium. Vaginal pore just anterior to vitelline reservoir, median in position. Vaginal tube not observed.

Vitellaria large and follicular, extending from posterior level of pharynx to near posterior end of body. Transverse vitelloducts fusing medially to form vitelline reservoir immediately anterosinistral to ovary. Main vitelloducts very large, confluent anteriorly behind pharynx. Egg *in utero* polyhedral, (6) 129 (112–142) long by (6) 104 (88.4–115) wide, with convoluted basal filament. Eggs occurring either singly or doubly in ootype-uterus complex.

Brain anterodorsal to pharynx. Four granular eyespots located dorsal to brain, first pair smaller and closer together than posterior pair.

Mediavagina new genus

Diagnosis: Trochopodinae. Body elliptical, flattened dorsoventrally. Prohaptor a pair of slightly pedunculated anterolateral suckers. Posthaptor subsessile, with delicate marginal membrane; ventral surface divided by five weakly-developed septa into central loculus and five peripheral loculi. Three pairs of dissimilar anchors on posterior two septa, 14 marginal hooks. Two pairs of eyes. Pharynx globular. Intestinal crura with medial and lateral dendritic branches, not confluent posteriorly. Testes two, tandem, equatorial in position. Vas deferens convoluted, making large loop on right just posterior to ootype, joining seminal vesicle in cirrus pouch. Prostatic reservoir inside cirrus pouch. Cirrus fairly short. Common genital atrium opening on left margin at posterior level of pharynx. Ovary pretesticular, oval, entire, median. Ootype surrounded proximally by Mehlis' gland cells; uterine egg with a single, convoluted polar filament. Vaginal pore opening ventrally in midline in region of vitelline reservoir. Vitellaria follicular, co-extensive with intestinal branches; vitelline reservoir immediately anterosinistral to ovary. Parasitic on marine teleosts.

Type Species: Mediavagina forsteri new species.

Discussion: Mediavagina n. gen. varies from every other genus of the subfamily Trochopodinae (Price, 1936) Sproston, 1946 in characters that are presently regarded as generic in rank. These characters are: (1) posthaptor divided by five weakly-developed septa into one central and

five peripheral loculi; (2) prohaptor consists of a pair of slightly pedunculated anterolateral suckers; (3) vaginal pore located medially in the region of the vitelline reservoir; and, (4) testes tandem. Due to the above differences the name *Mediavagina* n. gen., concerning the location of the vaginal pore, is proposed.

Mediavagina n. gen. is apparently most closely related to *Macrophyllida* Johnston, 1929 in that it possesses: (1) five weakly-developed septa, (2) tandem testes and, (3) prostate reservoir inside cirrus pouch.

The two new species of this new genus, *M. forsteri* n. sp. and *M. macropteri* n. sp., possess differences besides different hosts that are considered specific in rank. *M. macropteri* differs from the type species, *M. forsteri,* in the following (Table 5): (1) body larger; (2) testes smaller; (3) egg larger; (4) uterus sometimes with two eggs; and, (5) vaginal pore anterior to vitelline reservoir instead of posterior.

Fourteen specimens of *Mediavagina forsteri* were recovered from 21 specimens of *Latridopsis forsteri* (Castelnau) (Table 6). A total of 5 specimens of *Mediavagina macropteri* were collected from 31 specimens of *Nemadactylus macropterus* (Bloch and Schneider) (Table 6).

This fifth of a series on Monogenea from fishes of the southern Pacific Ocean discusses six species from five host species collected in Australian waters. Four monogeneids, *Sprostonia longiphallus, Allosprostonia tauvinae, Mediavagina forsteri,* and *M. macropteri,* are described for the first time. In addition, *Trochopus hobo* Yamaguti, 1942 and *Macrophyllida antarctica* (Hughes, 1928) Johnston, 1929 are redescribed.

Two new genera, *Allosprostonia* and *Mediavagina* are described. *Allosprostonia* has been proposed to include those Trochopodinae with five posthaptoral septa and paired prohaptoral suckers united by a common hood. *Mediavagina* is necessary to accommodate those species having five posthaptoral septa, tandem testes, and a median vagina. The subfamily Trochopodinae (Price, 1936) Sproston, 1946 is emended to accommodate members of the genus *Allosprostonia* since they resemble other Trochopodinae more closely than other groupings in the family Capsalidae.

New locality records are herewith established for *Trochopus hobo* Yamaguti, 1942 and *Macrophyllida antarctica* (Hughes, 1928) Johnston, 1929.

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